$$=\frac{3\sqrt{3}a^2}{2}+\frac{\pi a^2}{2\sqrt{3}}\int_0^{\frac{1}{3}\pi}\left(\frac{\tan\theta}{\theta}\right)^2 d\theta$$

$$=\frac{3\sqrt{3}a^2}{2}+\frac{\pi a^2}{2\sqrt{3}}\int_0^{\frac{1}{3}\pi}(1+\tfrac{2}{3}\theta^2+\tfrac{17}{45}\theta^4+\tfrac{62}{315}\theta^6+\ldots\ldots)d\theta,$$

$$=\frac{3\sqrt{3}a^2}{2}+\frac{\pi^2a^2}{6\sqrt{3}}\left(1+\frac{2\pi^2}{81}+\frac{17\pi^4}{18225}+\frac{62\pi^6}{1607445}+\ldots\ldots\right)=3.8693a^2 \text{ nearly.}$$

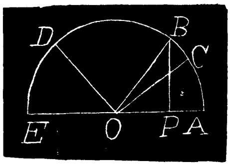
Also solved by the *PROPOSER*.

34. Proposed by B. F. FINKEL, A. M., Professor of Mathematics and Physics in Drury College, Springfield, Missouri.

Two points are taken at random on the circumference of a semicircle. Find the chance that their ordinates fall on either side of a point taken at randon on the diameter.

Solution by G. B. M. ZERR, A. M., Ph. D., Texarkana, Arkansas-Texas.

Let P be the random point on the diameter AE. Draw BP perpendicular to AE. Then one point must fall somewhere, as at C, on arc AB, the other somewhere, as at D, on arc BE. The chance thus obtained must be doubled as D might fall on AB and C on BE.



Let AO=unity, $\angle BOA=\theta$, $\angle COA=\phi$, $\angle DOA=\psi$.

Then $OP=\cos\theta$. $\therefore d(OP)=-\sin\theta d\theta$.

Let p=required chance.

$$\text{Then } p=\frac{\int_0^\pi\int_0^\theta\int_\theta^\pi \sin\theta d\theta d\phi d\psi}{\int_0^\pi\int_0^\pi\int_0^\pi \sin\theta d\theta d\phi d\psi}=\frac{1}{\pi^2}\int_0^\pi\int_0^\theta\int_\theta^\pi \sin\theta d\theta d\phi d\psi$$

$$=\frac{1}{\pi^2}\int_0^\pi(\pi\theta-\theta^2)\sin\theta d\theta=\frac{4}{\pi^2}.$$

PROBLEMS.

42. Proposed by CHARLES E. MYERS, Canton, Ohio.

A attends church 4 Sundays out of 5; B, 5 Sundays out of 6; and C, 6 Sundays out of 7. What is the probability of an event that A and B will be at church and C will not?

43. Proposed by HENRY HEATON, M. Sc., Atlantic, Iowa.

In a circle whose radius is a, chords are drawn through a point distant b from the center. What is the average length of such chords, (1), if a chord is drawn from every point of the circumference, and (2), if they are drawn through the point at equal angular intervals?